

Thread Dump Viewer for SAP NetWeaver AS Java



Applies to:

SAP NetWeaver AS Java 6.40 / 7.0X / 7.11 / 7.20 / 7.30 / 7.31

Summary

The Thread Dump Viewer is a tool for reading thread dumps from SAP NetWeaver AS Java

Author: Angel Penkov

Company: SAP

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Author Bio

Angel Penkov has worked for SAP Netweaver AS Java Development Support for 2 ½ years and as a java developer for 4 ½ years.



Table of Contents

| | |
|--|----|
| I. Introduction | 3 |
| II. Where to find Thread Dump Viewer | 3 |
| III. Opening thread dumps | 3 |
| IV. Common features | 4 |
| V. Deltas for SAP JVM threads. | 9 |
| VI. Command line parameters: | 10 |
| VII. Shortcuts | 10 |
| VIII. Troubleshooting..... | 10 |
| Related Content..... | 11 |
| Copyright..... | 12 |

I. Introduction

Thread Dump Viewer is a powerful tool for reading thread dumps from SAP NetWeaver AS Java and analyzing VM/thread behavior across several thread dumps. The main features of the tool are:

- GUI-based
- Reads several JVM machine TD formats – SAP/Sun/HP and IBM for AIX/Linux
- Provides easy access to multiple thread dumps
- Checks thread state across multiple dumps
- Shows statistics for application/system threads
- Enables you to follow lock chains
- Has filters that help you to see only the needed threads
- Allows you to show the CPU delta, Allocated memory delta, etc. for every thread (for SAP JVM only)

II. Where to find Thread Dump Viewer

You can download the latest version of the tool from [SAP note 1020246](#).

III. Opening thread dumps

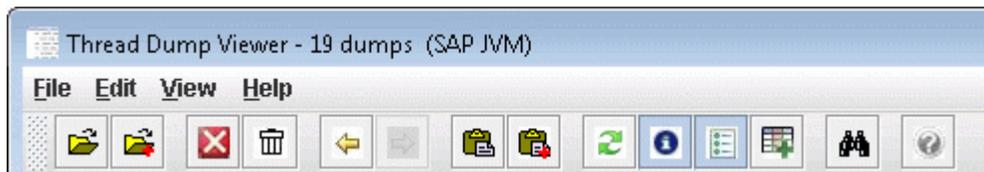
Start the Thread Dump Viewer with 'java -jar tdv.jar', where java is at least version 1.5. You can pass files containing thread dumps at the command line. Add the filenames as program parameters separated by space.

You can open thread dumps by choosing File->Open dialogs from the menu or by clicking on the corresponding icon on the toolbar. The dialogs allow multiple selections (useful for multiple javacore files). There are two options: "Open and remove current dumps" and "Open and add to current dumps".

If the thread dumps are in the clipboard you can also choose "Paste and remove current dumps" (Ctrl + V) or "Paste and add to current dumps" (Ctrl + Shift + V).

IV. Common features

When you open the thread dumps the title bar of the Thread Dump Viewer shows how many thread dumps have you opened and what's the type of the JDK (SAP, Sun or IBM).

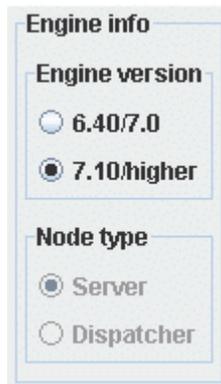


Thread dump viewer window shows two toolbars and thread dump pane.

Toolbars:

Beneath the top toolbar with buttons there is another toolbar with several sections.

The first one, "**Engine info**" enables you to choose the engine version, 6.40/7.0 or 7.10/higher and in case of 6.40/7.0 the type of the node – server or dispatcher:



In the second one, "**Dump**" there is a combo box containing all the thread dumps read by the viewer. You can choose which thread dump to show in the thread dump pane below. It also displays when the selected dump was taken and statistic for the threads in the currently selected thread dump – system threads, application threads, application managed threads, other threads, how many of them are free, etc.



Beneath the thread statistic table, you can see a label showing how many threads are visible in the split pane below.

Next section is “**Filters**”:

You can use filters to reduce the number of the threads showed in the split pane, to show only thread with specific type/state and to exclude a lot of standard threads for SAP NetWeaver AS Java.

To show only threads with specific state (runnable, sleeping, waiting on monitor entry, etc.) choose a specific state from the combo box “**Thread state**”.

To show only threads with specific type (System, Application, Application managed, Other (non-system and non-application)) choose a type from the combo box “**Thread type**”.

To group all thread with similar stack trace in a single thread select the check box “**Compact view**”.

Note: When several threads are compacted in one thread and you click on their names on the left side in the split pane the right pane won't scroll, since it'll always show the compacted stack trace.

To hide all the standard threads from the engine select the check box “**Hide standard threads**”.

Standard thread is free system thread, free application thread, message server threads, enqueue server threads and other engine's waiting, sleeping or blocked threads which present in every thread dump of 6.40/7.00 engine and are NOT suspicious. Full list of the standard thread can be found in the directory /config inside of the tdv.jar file:

- /config/serverThreads.txt - standard threads for versions 7.10/higher
- /config/serverThreads640.txt - standard threads for server node in versions 6.40/7.0
- /config/dispatcherThreads640.txt - standard threads for dispatcher node in versions 6.40/7.0

You can edit these files and add/remove standard threads. Make sure that there is an empty line between every two threads. Please DON'T change/delete the first 3 threads from every file

Note: When you change the filters (except “Compact view”) you can see in the section “**Dump**” how the number of the currently showing threads changes.

The section “**Additional info**” gives some more information that can be gathered from the thread dumps which you can see when you click on the corresponding button:



Note: Most of the buttons are available only for IBM JDKs.

The last section of this toolbar, “**Legend**”, shows information about the colors and signs on the buttons in the thread dump pane:

| Legend | |
|-----------------------------|----|
| Idle | |
| Running | ■ |
| Blocked | ■ |
| Different than the previous | != |
| Same as pervious | < |
| No previous dump | - |
| Missing | X |

Split pane with threads:

Below the toolbars there is a split pane which shows the threads of the currently selected thread dump. On the left you can see the names of all the threads. When you click on a thread name the thread appears on the top on the right:

The screenshot shows the "Thread Dump Viewer" interface. At the top, it says "Currently showing 208 threads." Below this is a list of threads on the left, with "Application [24]" selected. On the right, the details for "Application [24]" are shown, including its thread ID and stack trace. Above the stack trace, there is a "Thread states" section with a row of buttons: a larger green button with "-", a green button with "!=", a grey button with "!=", and four grey buttons with "X". Below the stack trace, there is another "Thread states" section with a row of buttons: a grey button with "-", a grey button with "<", a grey button with "<", and four grey buttons with "X".

Above every thread there is a section “**Thread states**”. There is one button for every opened thread dump. One of the buttons is a bit bigger than the others and indicates the thread dump which you are looking at (if

the third button is bigger than you are looking at thread dump number 3). The buttons are hyperlinks and you can use them to navigate to the same thread in the corresponding thread dump. For instance in the screenshot above if you click on the second button you'll navigate to the same thread (Application [24]) in thread dump number 2.

Note: If the checkbox “**Compact view**” is clicked and if there are more than one thread with the same thread stack this button group won't be visible.

The buttons help you to follow the thread behavior across multiple thread dumps. There are two indicators that you should check:

a. Color – shows the status of the thread:

green – runnable

red – blocked – waiting on a monitor which is held by another thread

gray – idle – every other status than runnable and blocked

b. Sign – shows the state of the thread compared to the same thread in the previous thread dump:

“-” – there is no previous thread dump

“<” – the thread is the same as in the previous thread dump

“!=” – the thread is different than in the previous thread dump

“X” – the thread doesn't exist in the previous thread dump (the button is disabled in this case)

Note: These colors and signs are explained in section “Legend” on the toolbar.

Thread dump viewer gives you the possibility to follow the monitor chains. If some thread is waiting on a monitor owned by another thread in thread dump viewer the monitor line ends with “..., locked by <Locking thread>”, where <Locking thread> is a hyperlink and you can use it to check the locking thread:

```

Thread states: ■ ■ ■ < ! X
"HTTP Worker [11]" tid=0x2bd990f200 waiting for monitor entry cpu=73340.0 ms allocated memory=2.94 GB nid=0x4365 prio=1
at com.sap.bc.proj.startup.fca.FCAServer.accept(Lcom.sap.bc.proj.startup.fca.FCAConnection;(FCAServer.java:105)
- waiting to lock<0x2aef7fe908> (a com.sap.bc.proj.startup.fca.FCAServer), locked by HTTP Worker \[6\]
at com.sap.engine.services.httpserver.server.Processor$FCAProcessorThread.run(V(Processor.java:198)
at com.sap.engine.core.thread.impl3.ActionObject.run(Ljava.lang.Object;(ActionObject.java:37)
at java.security.AccessController.doPrivileged(Ljava.security.PrivilegedAction;Ljava.security.AccessControlContext;)Ljava.lang.Object;(Native Method)
at com.sap.engine.core.thread.impl3.SingleThread.execute(Lcom.sap.engine.core.thread.ThreadContextImpl;)V(SingleThread.java:140)
at com.sap.engine.core.thread.impl3.SingleThread.run(V(SingleThread.java:227)

```

When you navigate to the locking thread click on its name to have a popup menu with hyperlinks to all the threads locked by this thread:

Thread states: - !- !- !-

| | | |
|----------------------------------|---|---|
| "HTTP Worker [6]" | | tid=0x7bd06f2200,runnable,cpu=86840.0,ms allocated memory=1.95 GB nid=0x4363 prio=1 |
| 14 threads locked by this thread | | |
| at com.sap.bc | HTTP Worker [2] | ap.bc.proj.jstartup.fca.FCAConnection;(Native Method) |
| at com.sap.bc | HTTP Worker [8] | proj.jstartup.fca.FCAConnection;(FCAServer.java:107) |
| - locked<0x2 | HTTP Worker [4] | ver) |
| at com.sap.en | HTTP Worker [3] | cessorThread.run()V(Processor.java:198) |
| at com.sap.en | HTTP Worker [10] | g.Object;(ActionObject.java:37) |
| at java.securit | HTTP Worker [11] | ilegedAction;Ljava.security.AccessControlContext;)Ljava.lang.C |
| at com.sap.en | HTTP Worker [7] | n.sap.engine.core.thread.ThreadContextImpl;)V(SingleThread.jav |
| at com.sap.en | HTTP Worker [12] | Thread.java:227) |
| Thread states | | |
| HTTP Worker [9] | | |
| "HTTP Worker [14]" | | du=0.0 ms allocated memory=1.23 kB nid=0x435d prio=1 |
| at com.sap.bc | HTTP Worker [0] | proj.jstartup.fca.FCAConnection;(FCAServer.java:105) |
| - waiting to lo | HTTP Worker [5] | .FCAServer), locked by HTTP Worker [6] |
| at com.sap.en | HTTP Worker [1] | cessorThread.run()V(Processor.java:198) |
| at com.sap.en | HTTP Worker [13] | g.Object;(ActionObject.java:37) |
| at com.sap.en | engine.core.thread.impl.ActionObject.run()Ljava.lang.Object;(ActionObject.java:37) | |
| at java.security | AccessController.doPrivileged(Ljava.security.PrivilegedAction;Ljava.security.AccessControlContext;)Ljava.lang.C | |

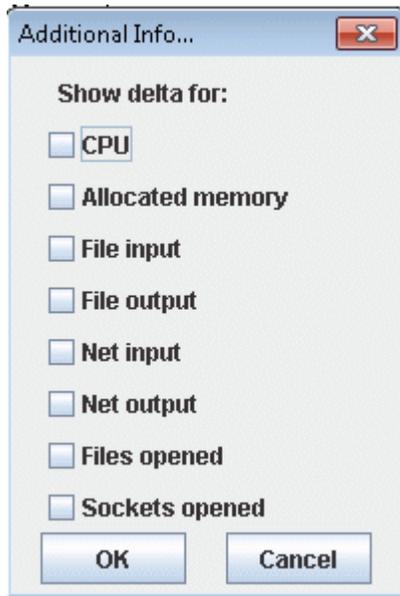
Note: The number of the threads locked by particular thread can be seen as a tooltip or in the status bar when you point the name of the thread with the mouse.

You can hide the stack traces in the right side of the split pane and show only thread name by choosing Edit -> "Show/Hide stack traces" or select the button from the toolbar.

You can choose Edit->Find (Ctrl+F or the toolbar button) to search a text inside the currently showed threads.

V. Deltas for SAP JVM threads.

SAP JVM thread dumps contain information which shows CPU usage, allocated memory, file input, files opened, etc. per thread. Thread dump viewer shows this information in the header of every thread but also gives a possibility to check what are the deltas of these indicators between two consecutive dumps. For instance if we have 3 dumps we can check how many files were opened by specific thread between dumps #1 and #2 and between #2 and #3. We can also see how much memory was allocated by specific thread between dumps #1 and #2 and between #2 and #3, etc. To enable this option you have to select from the menu View->Additional Info (SAP JVM only)... or select the same option from the context menu. A dialog window with the available deltas will appear:



Here you can select the deltas that you want to be shown. After clicking OK for every thread you will have a table with the selected deltas:

| Thread states: | - | != | != | != | != | < | < | < | != | != | != | != | != | != | != |
|---------------------------|---|----------|----------|----------|----------|----------|---|---|----|----|----|----|----|----|----|
| | | Dump # 1 | Dump # 2 | Dump # 3 | Dump # 4 | Dump # 5 | | | | | | | | | |
| CPU delta | - | - | - | 1062.50 | - | 5984.38 | | | | | | | | | |
| Allocated memory delta(B) | - | - | - | 43247240 | - | 80492584 | | | | | | | | | |

"Agent Execution" tid=0x4aa220 in Object.wait() cpu=2734.38 ms allocated memory=8.5721
 files opened:5 socks opened:0 nid=0x1ad4 prio=6
 at java.lang.Object.wait(J)V(Native Method)
 - waiting on<0x9591e420> (a com.wily.util.adt.BlockingQueue)

For every dump you can see the delta of the corresponding indicator (CPU, allocated memory, etc.) with the previous thread dump.

If you want to see the thread with the biggest delta for specific thread dump you can select View->Go to thread in this dump with->Biggest CPU delta, Biggest allocated memory delta, etc. the same option is available from the context menu.

Note: The information for the used CPU, allocated memory, files opened and so one is not available in every SAP thread dump. Depending on the JVM version and OS version some of this information is missing. In this case it will be disabled in the dialog "Additional Info..." and won't appear in the table.

VI. Command line parameters:

You can specify the version of the java engine at the command line as a first parameter: “-version 710” or “-version 640”. 640 is the default version. You can also add the filenames as program parameters after the version (if specified) separated by space.

Examples:

```
'java -jar tdv.jar -version 710 <file1> <file2> <file3>..''
```

```
'java -jar tdv.jar <file1> <file2> <file3>..''
```

VII. Shortcuts

Ctrl + O - Open and remove current dumps
Ctrl + Shift + O - Open and add to current dumps
Ctrl + Shift + R - Remove current dump
Ctrl + R - Remove all dumps
Ctrl + B - Back
Ctrl + F - Forward
Ctrl + C - Copy current selection
Ctrl + V - Paste and remove current dumps
Ctrl + Shift + V - Paste and add to current dumps
Ctrl + F - Find
F3 - Find next
Ctrl + H - Contents
Home - Scroll to first thread
End - Scroll to last thread
Page Up - Scroll one page up
Page Down - Scroll one page down

VIII. Troubleshooting

First of all please make sure that you are using the latest version of the thread dump viewer which is available in note 1020246 (to check the version click on Help->About). If you have problems with it please send the thread dump(s) and the tdv.jar file to angel.penkov@sap.com together with detailed problem description.

Related Content

[Note 1020246 - Thread Dump Viewer for SAP Java Engine](#)

[Note 710154 - How to create a thread dump for the J2EE Engine 6.40/7.0](#)

[Note 1095473 - How to get a full thread dump in AS Java \(version 7.10 and above\)](#)

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